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FORM P.1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT

AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30 (1) – Regulation 22)

20007587

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate.

OFFICIAL APPLICATION NO.		S & F REFERENCE
21 01	20007587	PA129954/ZA

FULL NAME(S) OF APPLICANT(S)

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TITLE OF INVENTION

54 MINING MACHINE FOR MINING UNDERGROUND DEPOSITS

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. THE EARLIEST PRIORITY CLAIM IS:

COUNTRY: AT NUMBER: A 78/2000 DATE: 18 JAN 2000

~~THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.~~

~~21 01~~

~~THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.~~

~~21 01~~

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. Two copies of a complete specification of 7 pages.
- ☒ 2. Drawings of 5 sheets.
- ☒ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☒ 4. A copy of Figure 2 of the drawings for the abstract.
- ☒ 5. Assignment of invention.
- ☒ 6. Certified priority document.
- ☒ 7. Translation of the priority document.
- ☐ 8. Assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No .
- ☒ 10. Declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.
- ☐ 14. Other.

74 ADDRESS FOR SERVICE: SPOOR AND FISHER, SANDTON

Dated: 18 December 2000

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PATENT ATTORNEYS FOR THE APPLICANT(S)

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FORM P.7
(To be lodged in duplicate)

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

COMPLETE SPECIFICATION

(Section 30(1) – Regulation 28)

OFFICIAL APPLICATION NO.			LODGING DATE	
21	01	20007587	22	18 DEC 2000

INTERNATIONAL CLASSIFICATION	
51	E21C

FULL NAMES OF APPLICANT	
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TITLE OF INVENTION	
54	MINING MACHINE FOR MINING UNDERGROUND DEPOSITS

The invention relates to a mining machine for mining underground deposits comprising a caterpillar-type moving gear and a swivelling jib arm, on which mining tools are mounted rotatably.

Gallery driving machines, which generally are also suitable for universal use, are used in the first instance for the driving of galleries, when the direction in which the machine is moved coincides with the direction in which the gallery or tunnel is driven. Depending on the size of the maximum profile that is to be cut, these machines generally have jib arms that can move to all sides, on which cutting tools are mounted rotatably. The tools themselves are moved over the working face transversely to the driving direction and subsequently, for a new opening up, are again shifted or moved in the longitudinal direction of the machine and accordingly in the longitudinal direction of the gallery.

For the mining of underground deposits, machine types have been developed which generally can be moved along a conveying system parallel to the seam or deposit. Depending on the thickness of the seam, different types have become known, which as a rule are fixed in the mining gallery by chains or cable lines. From the DE-OS 38 09 768, for example, a process for mining underground deposits has become known, with which a provisional bore is made between the two galleries that are driven first, and with the aid of a chain or cable winch a milling operation with oppositely directed milling rollers is carried out from the bottom driving gallery to the top driving gallery. Due to the steepness of the mining gallery, the exposed or mined material can always fall down onto a conveying system arranged in a driving gallery. Especially for the mining of minerals or coal, longwall mining machines are known, with which the mining tool is moved along on a haulage way. Thus, for example, from the DE-OS 195 40 362 a mining device has become known, the main cutting tool of which is fitted with discs, wherein these discs are associated with forward or follow-on cutting rollers. This device is moved on a haulage system in the longitudinal direction of the gallery to be mined.

It is now the object of the invention to create a mining machine of the type mentioned at the outset, which can also be moved without the aid of cables and can also be used for low seams of any steepness, and which is particularly suitable for mining harder materials, and offers the possibility of carrying out an automated, remote controlled mining operation. To address this object, the mining machine according to the invention essentially consists in that the jib arm is mounted on a carriage that can be moved in the longitudinal direction of the machine, can swivel around an axis extending substantially transversely to the longitudinal direction of the machine and the angle of incidence of which is adjustable, the cutting tools are in the form of discs and are arranged on a roller-type head mounted on the jib arm which can be driven and rotate around an axis extending substantially parallel to the swivelling axis of the jib arm, the discs are arranged on the head rotating around axes extending substantially parallel the axis of rotation of the head at different

distances from the front of the head, and the machine frame connected to the caterpillar moving gear and carrying the carriage can be braced in the gallery. Due to the fact that the jib arm is mounted rotatable around an axis that extends substantially transversely to the longitudinal direction of the machine and with an adjustable angle of incidence on a carriage that can move in the longitudinal direction of the machine, on the whole a very low overall height can be realised, wherein, proceeding from a position in which the machine is suitably braced, by moving the carriage in the longitudinal direction and swivelling the cutting arm or jib arm, it is possible to mine a part of the seam which corresponds to the carriage path. Because the cutting tools are in the form of discs and are arranged on a roller-type head mounted on the jib arm which can be driven and rotate around a substantially parallel axis transversely to the swivelling axis of the jib arm, a cutting tool is provided with which it is possible to also mine and undercut harder materials, wherein the undercut material can in each instance be removed via the mining gallery and in this way can be moved away on a conveyor provided in the bottom driving gallery. Such a construction stands out by small dimensions at a high cutting capacity, wherein in order to carry out the mining operation it suffices to in each instance swivel these rotatably mounted discs upwards around the swivelling axis of the jib arm extending substantially parallel to the floor and at the same time shift them in the longitudinal direction of the seam. In particular, with such a mining process, at the beginning of the mining operation, when the machine itself is suitably anchored, the longitudinal carriage is completely moved out, and the cutting operation takes place by the vertical swivelling of the cutting rollers simultaneously with the continuous pulling back of the cutting jib by means of the longitudinal carriage, so that the required opening-up operations and the mining can be carried out. Because the discs are arranged on the head rotating in substantially parallel axes around the axis of rotation of the head, at different distances from the front of the head, a plurality of undercutting grooves can be produced with such a head, so that a quick and secure breaking out also of harder materials is possible. Because the machine itself has a caterpillar moving gear, it is extremely manoeuvrable and can also be moved independently without external bracing, wherein the bracing of the machine frame in the gallery can take place by cables or, as corresponds to a preferred further development, by support props. The construction is, therefore, advantageously such that the machine frame carries support props for bracing the machine between roof and floor, so that when mining moderately steep galleries, an anchoring by cables can be dispensed with, seeing that the machine can after all move by itself.

To further increase the cutting capacity of such a machine while at the same time retaining the smallest possible dimensions, the construction is advantageously such that the discs are arranged with a common enveloping circle which is concentric to the axis of rotation of the head.

So as to obtain, at the beginning of the opening up operation and at the beginning of the dipping into the seam, a suitably accurate fixing of the thickness of the seam to be mined, the machine can

be positioned appropriately by means of the caterpillar moving gear. A more rapid and secure correction of the correct positioning can be realised in a simple manner when the carriage, in addition to its mobility in the longitudinal direction of the machine, is also mounted such that it can be moved transversely to the longitudinal direction of the machine. The mining machine is, therefore, positioned relative to the working face by means of the caterpillar moving gear or with the aid of cable winches and chains, and is fixed in this position, whereupon a precision adjustment of the break-in depth is made possible by moving the carriage in a transverse direction.

The construction is advantageously such that the axes of at least 4, preferably at least 6, discs are arranged on the head, as a result of which with slowly revolving heads an effective cutting can be obtained. Conventional hydraulic or electric motors can be used to drive the heads, wherein the cutting pressure is mainly determined by the traversing drive of the carriage.

The discs at the front of the head, as already mentioned, can be arranged at different axial distances from this front, so that during a revolution of the head several cutting grooves can be cut concentrically and axially adjacent, as a result of which the efficiency of the mining operation can be increased considerably. In this case the construction is advantageously such that in each instance discs arranged diametrically opposite relative to the axis of rotation of the head, seen in the axial direction, are arranged at the same distance from the front of the head.

To increase the stability of the machine in the case of an extremely short and low type, the construction is preferably such that the caterpillar moving gear is arranged asymmetrically relative to the longitudinal centre plane of the machine and the caterpillar adjacent to the head, seen in the longitudinal direction of the machine, is arranged set back relative to the opposite caterpillar. During the mining operation the multi-axially loaded head and jib arm are, therefore, adequately supported by the opposite caterpillar moving gear, also when the jib arm and carriage are in the fully moved-out position. At the same time such an arrangement permits a suitable positioning of support props for an optimal absorbing of the bracing forces, seeing that on the side of the machine frame opposite to the head, in the area of the caterpillar moving gear arranged further to the front, there still remains place on the machine frame for the provision of a support prop. In this case the construction is advantageously such that at least one support prop of the machine is arranged close to the caterpillar facing away from the working face, on the front end of the machine frame facing the jib arm, wherein the supporting can be improved even further when at least one further support prop is arranged close to the set-back caterpillar facing the working face on the rear end of the machine frame. On the whole a more easily manoeuvrable, self-propelled machine is, therefore, obtained, so that in particular with seams that are not too steep an additional bracing by chains or cables can be dispensed with. For particularly steep galleries, however, the construction is preferably such that on the rear end of the machine frame and/or the

caterpillar carrier of the caterpillar moving gear, connection points are provided for bracing cables, in particular cable winches, so that the machine according to the invention is suitable for universal use. So as to be able to carry out a temporary securing of the rock, the mining machine is preferably provided, on the side facing away from the working face, with at least one anchor drilling and setting device.

In the following the invention will be explained in more detail with reference to an exemplified embodiment illustrated diagrammatically in the drawing. Fig. 1 shows a diagrammatic illustration of the mining process, with which between two galleries driven at different heights, an inclined seam is mined. Fig. 2 shows a perspective view onto the small-dimensioned mining machine according to the invention, Fig. 3 a side view in the direction of arrow III of Fig. 2, Fig. 4 a top view onto the machine of Fig. 2 and Fig. 5 a section along the line V-V of Fig. 3.

From Fig. 1 it can be noted that before starting the mining process, first two galleries 1 and 2 are driven at different heights, the seam extending in the area between these two galleries 1 and 2. Subsequently a first connecting gallery 3 is driven in the conventional manner along the seam and corresponding to the thickness of the seam, for which purpose conventional type gallery driving machines can still be used or also the shot-hole method. In the top driving gallery a ramp 4 is formed, on which a cable winch is supported, so that the machine can move completely out of the seam and can then again be manoeuvred back into the seam in a suitably moved position. The mining machine 5, as can be noted from Fig. 1, is braced in the gallery by props 6 and 7 between floor and roof, wherein in addition cables or chains 8 can be used, which are fastened to a cable winch 9 at the rear end of the machine. Fig. 1 furthermore illustrates diagrammatically the disc-carrying drum 10, as well as the jib arm 11 which can be swivelled in the height direction, the swivel drive of which is ensured by a hydraulic cylinder unit 12. The machine has a caterpillar moving gear indicated diagrammatically by 13. The details of this machine can be seen more clearly in the following figures.

From Fig. 2 it can be noted that the caterpillar moving gear 13 has caterpillars 14 and 15 on either side of the mining machine 5, the relative position of which with respect to the machine frame of the machine 5 is offset in the longitudinal direction. The caterpillar 15 adjacent to the head 10 of the jib arm 11 is set back in relation to the opposite caterpillar 14, so that the jib arm 11 together with a carriage 16 can be moved back correspondingly far in the direction of the double arrow 17 towards the machine frame of the machine 5. The support props 6 and 7 are arranged asymmetrically on the machine frame, wherein due to the caterpillar moving gear 14 being pulled further forward in the machine direction to the front end of the machine, a corresponding more forward supporting by the prop 7 on the side opposite to the cutting head 10 is made possible, as a result of which the stability is increased. Arranged on the frame or on the prop 7 is at least one

anchor drilling and setting device 29 for the temporary securing. In order to correct the position of the cutting head 10, the carriage 16 can be moved transversely in the direction of the double arrow 18, so that also after a bracing and moving out of the props 6 and 7, corrections of the position of the cutting tools are still possible.

On the head 10, which by means of, for example, a hydraulic motor can be made to rotate around the axis of rotation 19, discs 20, 21, 22 and 23 are provided at different axial distances from the front of the head 10, which discs during the rotating of the cutting head 10 around the axis of rotation 19, cut corresponding parallel grooves in the seam. As can be noted from the side view of Fig. 3, the jib arm 11 can be moved from a starting position 11' indicated by broken lines at the beginning of the mining operation into the pulled-back second position, to which end the carriage is moved in the direction of the double arrow 17. This is made clear once again by Fig. 4, in which in the top view onto the rotating cutting head 10, the different axial positions of the cutters 20, 21, 22 and 23 are once again clearly noticeable. The rotating of the head 10 around the axis of rotation 19 takes place here in the direction of the double arrow 24, and the moved-out position of the jib arm is again indicated by the broken line 11'. From the illustration of Fig. 4 it can also be noted that at the rear end of the machine cable winches 25 and 26 are provided, which permit a bracing of the machine by cables or chains in addition to the hydraulic props 6 and 7.

In the sectional view of Fig. 5 the carriage 16 can clearly be noted, over which a carriage guide 27 extends. Furthermore the hydraulic cylinder 12 can be seen, by means of which the jib arm 11 can be swivelled in the direction of the height, wherein this swivelling axis, which is substantially parallel to the floor, is indicated by 28.

* * *

Claims

1. Mining machine for mining underground deposits comprising a caterpillar-type moving gear and a swivelling jib arm, on which mining tools are mounted rotatably, characterised in that the jib arm is mounted on a carriage that can be moved in the longitudinal direction of the machine, can swivel around an axis extending substantially transversely to the longitudinal direction of the machine and the angle of incidence of which is adjustable, the mining tools are in the form of discs and are arranged on a roller-type head mounted on the jib arm which can be driven and rotate around an axis extending substantially parallel to the swivelling axis of the jib arm, the discs are arranged on the head rotating around axes extending substantially parallel to the axis of rotation of the head at different distances from the front of the head, and a machine frame connected to the caterpillar-type moving gear and carrying the carriage can be braced in the gallery.

2. Mining machine according to claim 1, characterised in that the machine frame carries support props for bracing the machine between roof and floor.

3. Mining machine according to claim 1 or 2, characterised in that the discs are arranged with a common enveloping circle which is concentric to the axis of rotation of the head.

4. Mining machine according to claim 1, 2 or 3, characterised in that the carriage, in addition to its mobility in the longitudinal direction of the machine, is also mounted such that it can be moved transversely to the longitudinal direction of the machine.

5. Mining machine according to any one of the claims 1 to 4, characterised in that the axes of at least 4 discs are arranged on the head.

6. Mining machine according to claim 5, characterised in that the axes of at least 6 discs are arranged on the head.

7. Mining machine according to claim 5 or 6, characterised in that in each instance discs arranged diametrically opposite relative to the axis of rotation of the head, seen in the axial direction, are arranged at the same distance

plane of the machine and a caterpillar adjacent to the head, seen in the longitudinal direction of the machine, is arranged set back relative to an opposite caterpillar.

9. Mining machine according to any one of the claims 1 to 8, characterised in that at least one support prop of the machine is arranged close to a caterpillar facing away from the working face, on the front end of the machine frame facing the jib arm.

10. Mining machine according to claim 9, characterised in that at least one further support prop is arranged close to a set-back caterpillar facing the working face, on the rear end of the machine frame.

11. Mining machine according to any one of the claims 1 to 10, characterised in that on the rear end of a machine frame and/or a caterpillar carrier of the caterpillar-type moving gear, connection points are provided for bracing cables.

12. Mining machine according to any one of the claims 1 to 11, characterised in that on the side facing away from the working face at least one anchor drilling and setting device is provided.

13. A mining machine substantially as herein described with reference to the accompanying drawings.

DATED THIS 18 day of DECEMBER 2000

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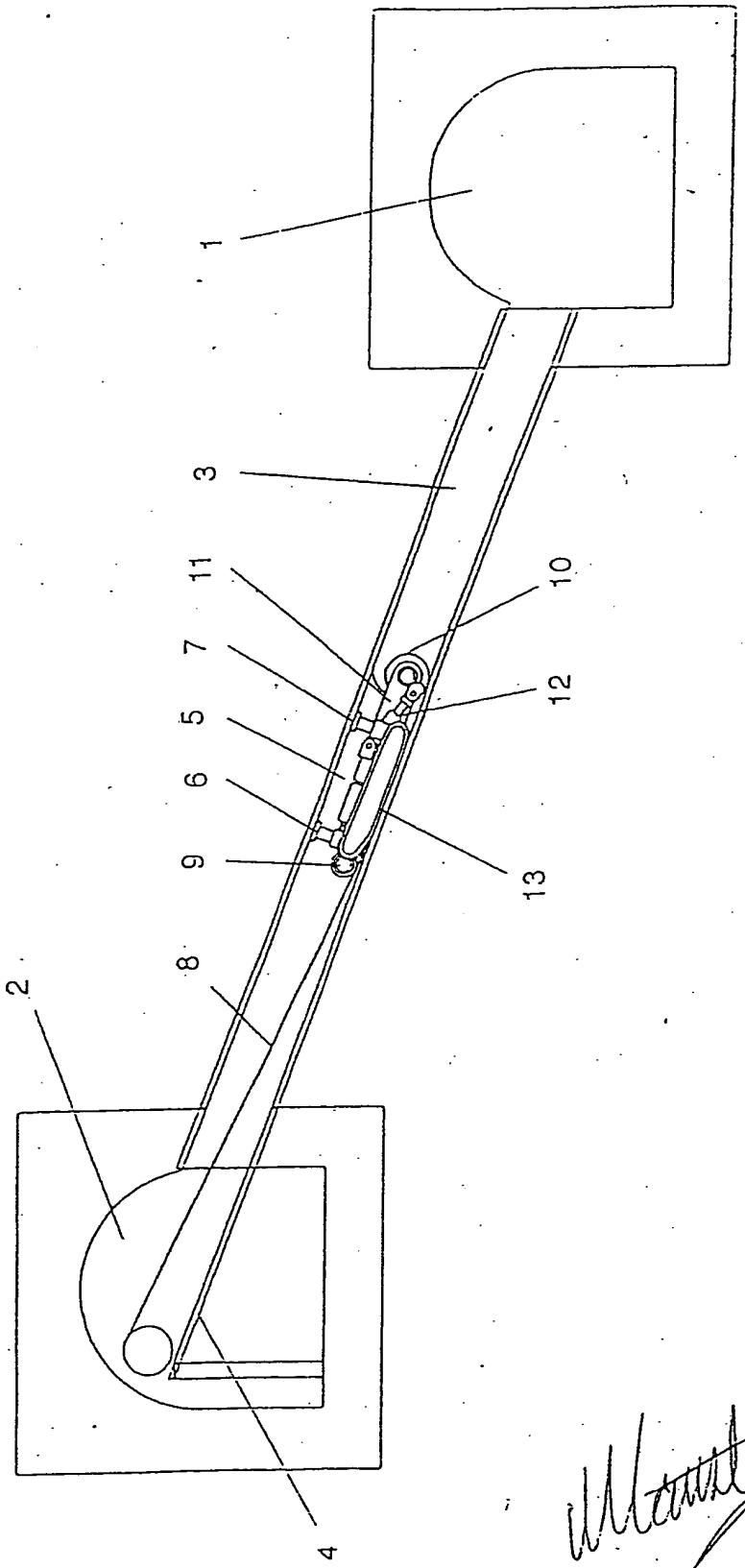

Fig. 1

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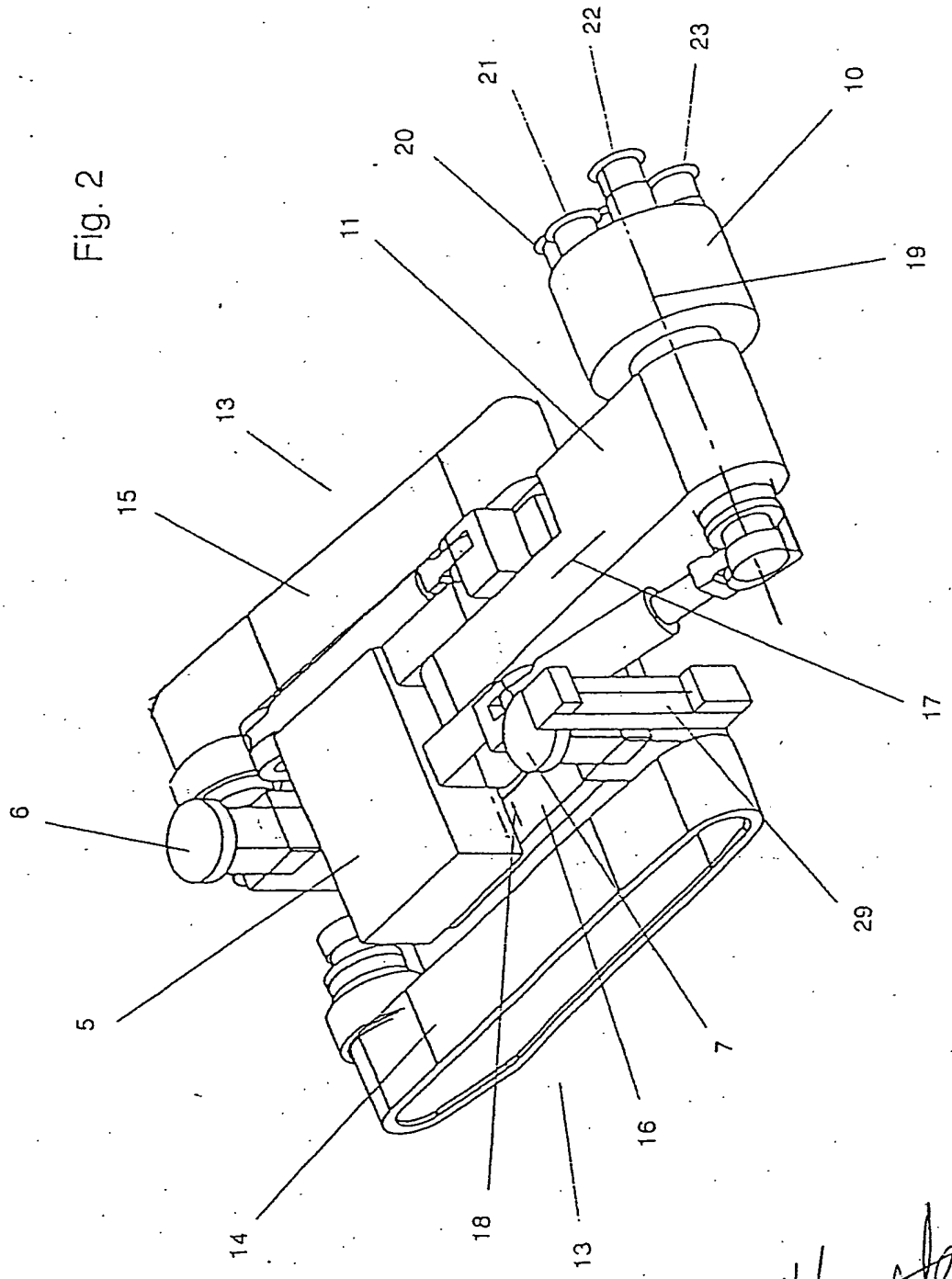
Fig. 2



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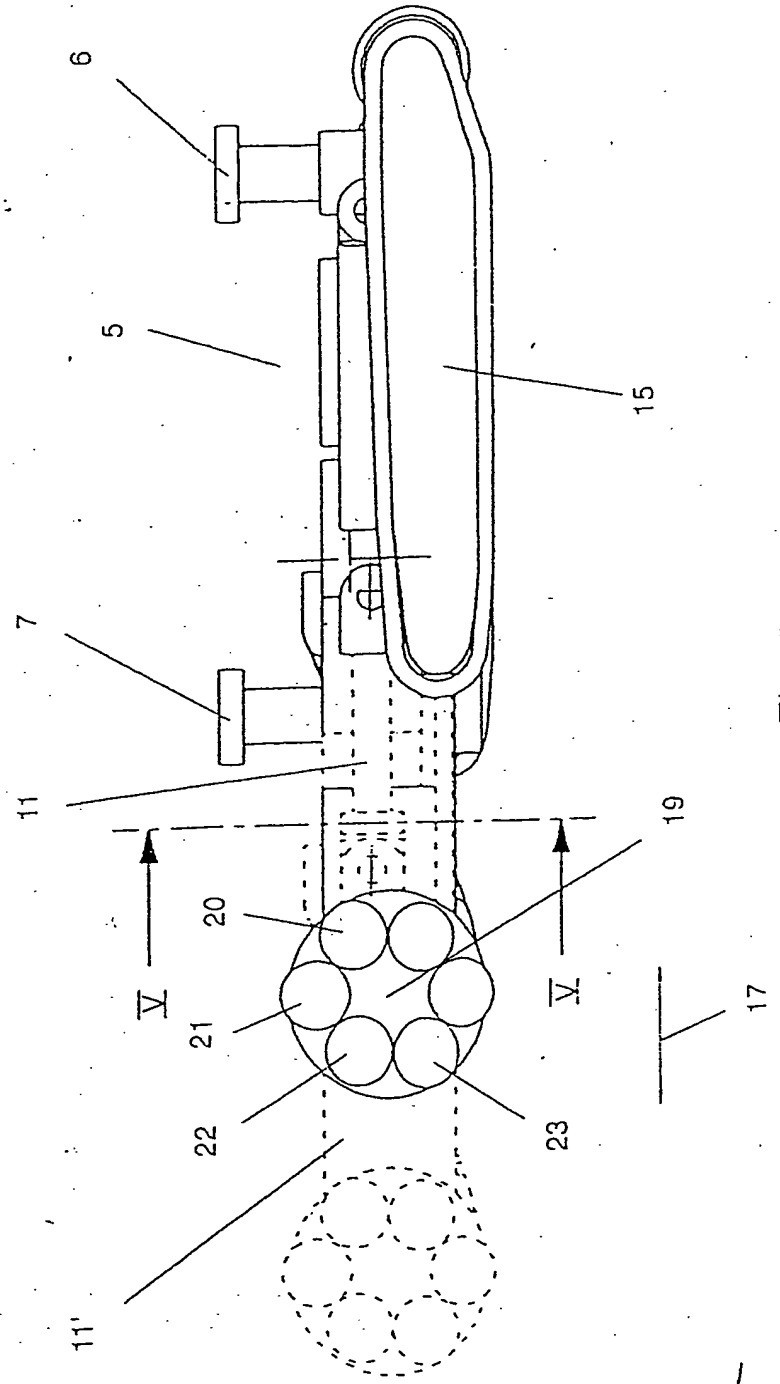

Fig. 3

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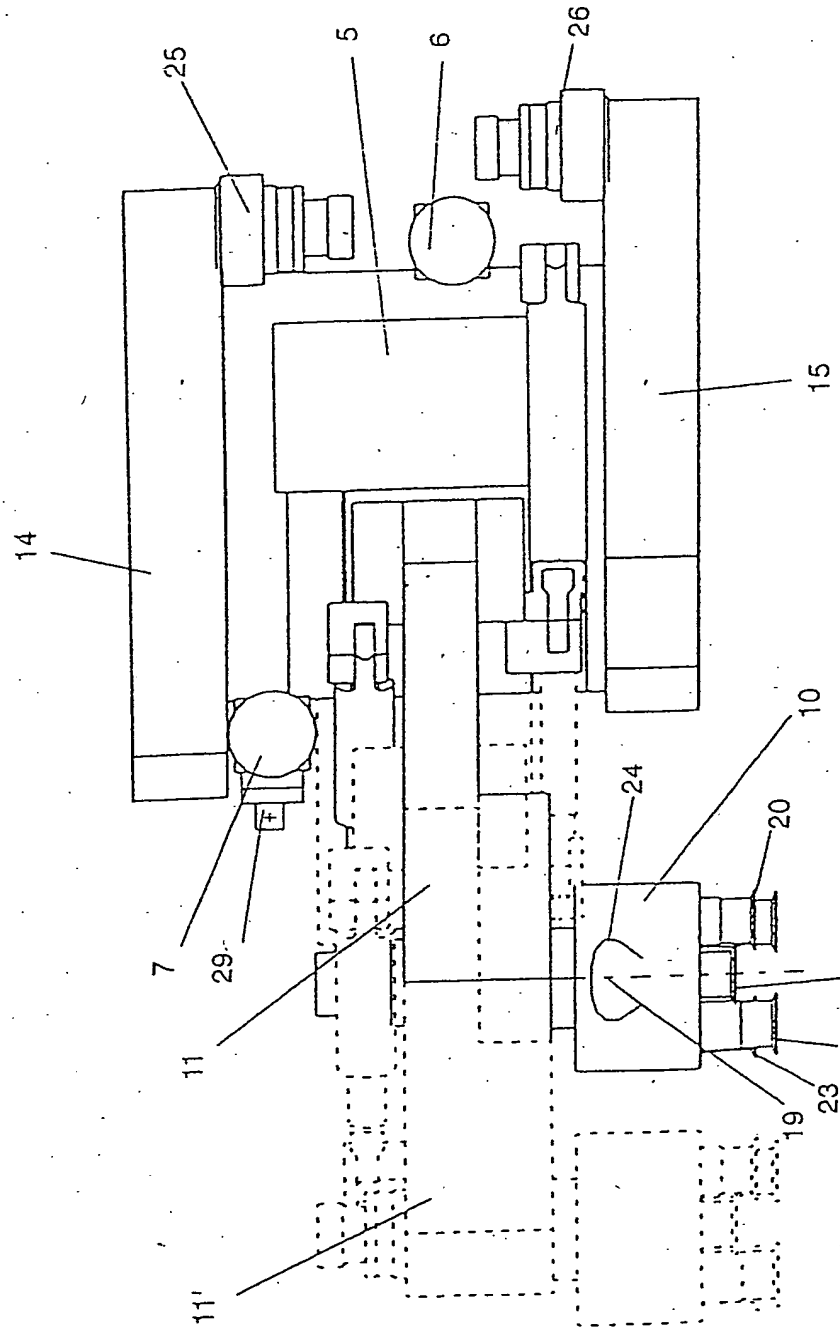

Fig. 4

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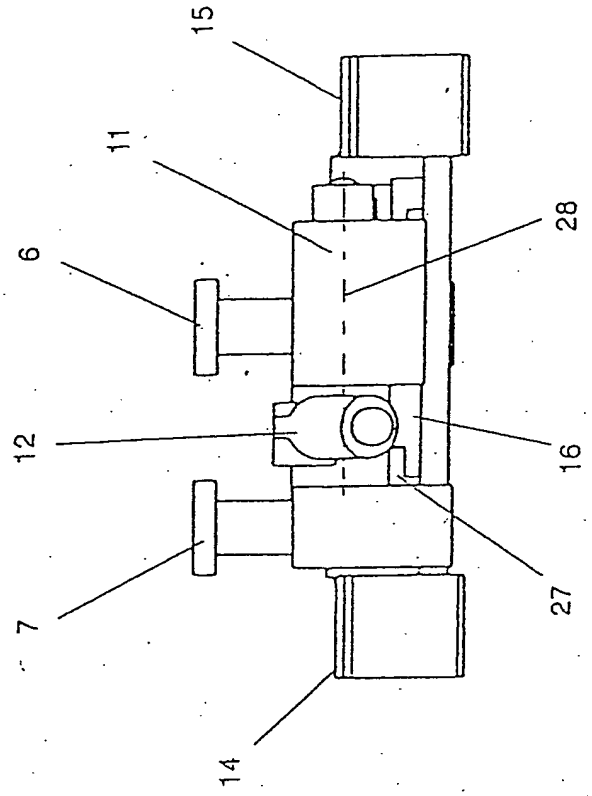

Fig. 5

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